PURDUE UNIVERSITY Discovery Park

Birck Nanotechnology Center
Discovery Park Engagement
Energy Center

SOLAR SEMINAR SERIES

SUMMER 2014 PHOTOVOLTAIC SEMINAR SERIES

GRAHAM 'GUS' NATHAN

DIRECTOR, CENTRE FOR ENERGY TECHNOLOGY, THE UNIVERSITY OF ADELAIDE, AUSTRALIA

BRK RM 2001

August 14, Thursday, 10:30 AM

Professor Nathan is the founding Director of the University of Adelaide's Centre for Energy Technology and recipient of an ARC Discovery Outstanding Researcher Award. With more than $20m of research funding, he works with energy technologies spanning the combustion of fossil and bio-fuels, concentrated solar thermal, geothermal energy, wind power, energy storage and in hybrid technologies. He works closely with industry both in developing novel technologies and in identifying and addressing key research challenges, especially those that can be addressed with advanced laser diagnostics. His past technology developments include being principal leader of the Chief Design Team for the award winning fuel and combustion system for the Sydney 2000 Olympic Relay Torch and joint leadership of the development of low NOx combustion technology in rotary cement kilns. He has published widely, with more than 120 publications in leading journals, 200 in peer-review conferences and 10 patents.

DIRECT HYBRIDS BETWEEN SOLAR THERMAL AND GASIFICATION PROCESSES

The seminar will describe the advantages of directly integrating concentrating solar thermal with combustion and auto thermal gasification processes for liquid fuels production and power generation. It will also outline three novel classes of technology to achieve this, namely a hybrid solar receiver combustor for application in high temperature cavity receivers, in twin-bed hybrid solar gasification, which offers increased syngas yield and quality relative to conventional auto-thermal gasification and lower CO_2 emissions, and in a hybrid solar chemical-looping-combustion concept, which offers a 60% solar share in a gas-turbine-combined-cycle. The presentation will highlight the need to fully account for the intermittent nature of the solar resource through pseudo-dynamic modelling of the full process for solar hybrid liquid fuels production via syngas and show how this variability can be accommodated through hybrids. It will explore a range of technology options, from 100% solar, via the Batch reactor developed at ETH Zurich, through to various options for hybridization, including dual bed gasification. Preliminary estimates of the cost of production will also be presented. Finally, it will explain how these novel hybrid technology concepts bring with them the need for new detailed understanding of the complex and coupled processes between high flux radiation and turbulent multi-phase and/or reacting flows.

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